RM
859
R313
v. 14
no. 3
c. 1
GERSTS

RADIUM

EDITED BY
CHARLES H. VIOL, Ph. D.
AND
WILLIAM H. CAMERON, M. D.

VOL. XIV DECEMBER, 1919 No. 3

CONTENTS

Report of Two Years' Use of Radium at the Nicholas Senn Hospital, Omaha, Nebraska. A. P. Condon, M. D , and C. H. Newell, M. D. 49

Calculation of Dosages When Radium Emanation Is Used. Charles H. Viol, Ph. D. - - 55

REVIEWS AND ABSTRACTS

John G. Clark, M. D. The Treatment of Myoma Uteri with Radium. - - - - - - - - - - - 58

Howard S. Jeck, M. D. Apparent Cure of Carcinoma of the Bladder by Radium. - - - - - - - - - 63

THE PROPERTY OF THE ACADEMY AT RESIDENCE TORONTO
LIBRARY
NOV 13 1919
UNIVERSITY OF TORONTO

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

Digitized by the Internet Archive
in 2009 with funding from
University of Toronto

http://www.archive.org/details/n03radium14came

RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

Edited and Published by Charles H. Viol, Ph. D., and William H. Cameron, M. D. with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

Subscription $2.50 per year, or 25 cents per copy in the United States and Canada in all other countries $3.75 per year.

Address all communications to the Editors, Forbes and Meyran Avenues, Pittsburgh, Pa.

VOL. XIV DECEMBER, 1919 No. 3

REPORT OF TWO YEARS' USE OF RADIUM AT THE NICHOLAS SENN HOSPITAL, OMAHA, NEB.

By A. P. Condon, M. D., and C. H. Newell, M. D.

About two years ago, realizing that radium was rapidly becoming popular as a therapeutic agent, and seemingly with very good reasons, we decided to give it a trial and attempt to find out just how much it offered as a relief or cure for some of the conditions in which it was said to be of value. Accordingly we procured 100 milligrams of pure radium element and began to use it wherever the need seemed indicated. We were extremely skeptical as to its having a very wide application.

After two years we can say that we have been very agreeably surprised to find that it really has a very wide field of usefulness and affords partial or complete relief in some conditions which have heretofore responded very poorly to any of the therapeutic means available. We believe that it falls far short of having as wide an application as is thought by some of the over-enthusiastic ones who are using it, but that gradually it is being recognized as a very valuable therapeutic agent, however, by no means to be considered a cure-all in the field of medicine.

In this report we propose to give some of the conclusions which we have reached in two years' time, but will not attempt to cover the entire field of radium therapy nor to tell of the actual technique of radium application. We have learned to recognize its indication in some conditions and its absolute contra-indication in others, and further to realize that in some instances, at least, it gives far better results than does the X-Ray.

Probably the widest application of radium is to be found in the treatment of new growths—both benign and malignant—and it is here that we have been agreeably surprised at some of the results obtained.

Among the benign growths may be mentioned angiomas, keloids and fibroids (especially fibroids of the uterus), and some of the other less common ones.

Angiomas of all types are so easily destroyed by radium that we feel safe in saying that one can be sure of good results in practically 100 per cent of such cases. This applies to both lymphangioma and to hemangioma. We have seen angiomas the size of a large orange disappear completely under the application of radium.

Keloids are found in most cases to respond to radium treatment very nicely. It is our custom to combine radium application with massage, and manipulation of the parts if any distortion has resulted from the contractions of the keloid. Usually the scar gets white, soft and gradually very pliable, and while never quite like the normal skin, the improvement is such that it affords the patients great relief. In these patients it is necessary to apply the radium at frequent intervals over a considerable period of time.

The treatment of uterine fibroid has been entirely changed in the last few years by the use of X-Ray and radium, and we have come to think that for treating this condition the latter is much superior to the former.

The radium treatment of uterine fibroid offers several distinct advantages over any other. Over the operative treatment it has the very great advantage of not being attended by mortality. There is absolutely no risk of life on the part of the patient receiving radium treatment. Further, there is little or no inconvenience to the patient who usually requires but one application of a few hours' duration. Rarely a second application is necessary.

It is not uncommon to see uterine fibroids which reach to or above the umbilicus begin after one radium application to reduce in size and continue without further treatment until they are very small or have entirely disappeared. This result may be expected in at least 75 per cent of cases, and some writers, as for instance Howard Kelly, say 95 per cent of cases.

To do this with X-Ray requires much more time, and we believe that the percentage of cases responding to that form of treatment is much less than with the radium application.

The hemorrhage of a uterine fibroid may be stopped in every instance by one intra-uterine application of radium. In this class of cases the application is simple, for as we feel that all these cases, especially if nearing the cancer age, should have a curettement for diagnosis. The radium can be applied at the same time. It is left in the uterus about twelve hours and no further treatment is necessary. We feel justified in attributing this result to the radium rather than to the curettement, as patients treated by only the latter get but temporary relief.

The treatment of malignant new growths is unfortunately not so successful as one might be led to hope from the remarkable results in the benign conditions.

In treating malignancy radium is used both post-operatively and on inoperable cases. We feel that every operable malignant case should be operated, and one should by no means attempt to treat the condition by any other means. Of this we shall have more to say later.

In treating sarcoma with radium, in patients upon whom for any reason an operation is not to be done, one sees some rather interesting results, in that the tumor gets smaller, the pain disappears and the whole process seems to be held in abeyance for a time, but it has never been our good fortune to see one entirely cured. We have seen several in which the tumor has entirely disappeared and the parts looked almost normal, but there has as yet not sufficient time elapsed to give accurate statistics.

Post-operatively in sarcoma it is the best we have to offer the patient. It should always be used, and it is possible that it reaches cells which to the surgeon have been inaccessible and undoubtedly retards the reappearance of the sarcoma locally. For this type of patient we feel that radium is very much superior to X-Ray.

In cases of melanoma, whether or not they have already undergone sarcomatous change, one should always resort to operation. These sarcomas nearly always occur in parts where they are very accessible and may be removed with little danger to, or disfigurement of, the patient. And we feel that to treat this condition with anything which may possibly result in stimulation rather than in destruction of the tumor is absolutely wrong.

In the treatment of carcinoma one meets with very striking results. Here again we believe that the only type of carcinoma, which it is justifiable to treat with radium, is that type of tumor from which no metastasis occurs and where an operation might result in disfiguring the patient, as, for instance, a rodent ulcer occuring near the eye. In these cases application of radium for one hour usually results in a cure. And the patient really runs no risk of making a bad matter worse, as these tumors do not metastasize, and if they should not respond to radium treatment can be removed later.

To use radium without operation in any malignant condition where metastasis is likely to form, even though the tumor be situated where a poor cosmetic result is likely, is to be condemned. We see patients very frequently who have malignant conditions, such as carcinoma of the lip, in which an attempt has been made to treat it by X-Ray or radium, and in which the treatment has been a complete failure, or in which the local condition has disappeared and metasasis has occurred. So much time has been lost and the malignancy has become so widespread that no operative relief can be offered the patient. How much more sensible it is to remove the primary growth, and tributary lymph nodes as completely as possible, and in a few minutes rid the patient of the source of his trouble and then depend upon the radium therapy to prevent a recurrence of the condition.

As in sarcoma, we use radium in carcinoma in all inoperable cases. And the most frequent of these is carcinoma of the cervix uteri. Every surgeon sees many of such patients who have neglected to present themselves to their local physician until the condition has reached the stage where it is absolutely impossible to offer the patient operative relief. Carcinomas of the cervix metastasize so early and so widely that in practically every case the condition is beyond the reach of the surgeon when the patient first comes under observation. In fact, we have not done a radical operation for cervix carcinoma in five years, and even before we had radium to use we had been content to remove the tumor as widely as possible, cauterize the region and trust to X-Ray for further results. Needless to say, we have always been much disappointed in our results in cervix carcinoma. The use of radium in

these cases produces a result little short of marvelous, but the end result we feel has not been changed by its use.

Under radium treatment one may feel sure that the typical, very offensive odor of these cases will disappear almost immediately. With it the discharge disappears, and after a few days' time the patient is almost entirely free from pain. The mass becomes much smaller, and the uterus which has been fixed in the pelvis may even become movable. It is said that radium treatment in these cases often results in recto-vaginal or vesico-vaginal fistula. We have never had this occur, and believe that it can be avoided by properly protecting the rectum and bladder with gauze. However, were we sure that it would occur, we would not consider this a contra-indication to the use of radium.

Right here let us tell of a case which seems to be the most striking in our experience of treating cervix carcinoma with radium. Dr. Koutsky, of South Omaha, referred us a patient who was emaciated, cachectic, and presented a large cauliflower mass on the cervix. This was bleeding, emitting a very foul discharge, accompanied by an equally foul odor. The uterus was absolutely fixed in the pelvis, and the patient was as nearly hopeless as one often sees. As a forlorn hope and as a means of making her more comfortable, it was decided to use radium. The patient received one treatment, was taken home and asked to report in three weeks. Returning at this time she did not look like the same woman. Her color had improved, her expression was different. She was very happy in that she was free from pain, odor and discharge. On examination the cervix felt almost normal and the uterus was movable. A second radium treatment was given at this time. On this patient, as on every patient that we have reported, the diagnosis was made microscopically.

About five months after this examination the patient died. Dr. Koutsky did an autopsy, found a bilateral poly-cystic kidney, and to this attributed the woman's death. He removed the uterus, the upper part of the vagina and the adnexa, and on careful search of many sections we were unable to find any evidence of carcinoma. In the light of our other experience, however, we still feel that had this woman lived long enough she would in all probability have died of a metastatic carcinoma.

We wish to tell of one rectal carcinoma which, on the presentation of the patient, seemed to be absolutely inoperable and the patient was advised to have radium applied. At the end of six weeks he presented himself for examination and his condition was so much improved that the condition was found to be easily operable. A Harrison-Cripps operation was done, and here again we were unable to find any evidence of malignancy in the parts removed.

We feel that an exceedingly high operative mortality is one great indication for radium, and if a patient with a rectal carcinoma presents himself to us, in which we feel that a simple Harrison-Cripps operation will not be sufficient and that a radical operation will be necessary, we usually tell the patient somewhat as follows: "Your chances of cure by operation are by no means 100 per cent. The immediate mortality which you will have to run is about 30 per cent, and your convalescence will be rather stormy and protracted. On the other hand, by the use of radium, you run absolutely no risk to your life. Although the chances of complete cure are perhaps less than by a successful operation, you can be made comfortable, free from pain, free from discharge, and your life prolonged from two to four years." After discussing this

with the patient we usually ask them to decide, and rather feel that if they decide in favor of radium they have not done so unwisely.

We have had a number of cases of carcinoma of the body of the uterus, the diagnosis being established by curettement, and in all these patients, if they are pretty good operative risks, we advise operation for the reason that these tumors metastasize very slowly, the mortality is low and the chance for complete cure is very good.

It might be interesting to state that we have had three cases of skin carcinoma occurring in patients being treated by X-Ray for deep-seated carcinoma, and we consider this a point to be considered in discussing the relative value of X-Ray and radium. We have never seen carcinoma as a result of radium treatment. In fact, the latter is recommended as a treatment for the former. In our experience, however, this has been unsuccessful.

The treatment of pre-cancerous conditions is a very important subject and deserving of considerable attention, as much harm may result by the injudicious use of X-Ray or radium in these conditions. We feel that absolutely the only precancerous condition which one is justified in treating non-surgically is leukoplakia buccalis. This condition is rather benign. Its location in the mouth renders it impossible of surgical removal, and it had been our custom to cauterize these areas, but since working with radium we have found that it responds very nicely to small unfiltered doses of that element. In treating this condition, as in treating carcinoma of the mouth, it is very easy to burn the tongue. However, these burns, contrary to those produced by X-Ray, respond very quickly to treatment and do not give us much uneasiness. We usually treat them by local applications of silver nitrate.

The radium treatment of other pre-cancerous conditions, such as black elevated moles, breasts of abnormal involution, or a crack in the lip which does not respond to ordinary treatment, is a vicious practice. These conditions may be removed surgically with very little risk to the patient and, as mentioned above, radium or X-Ray treatment may result in stimulating rather than destroying the lesion.

Among the conditions other than new growths, in which radium therapy has been found by us to be of distinct value, may be mentioned granulomas, uterine hemorrhage (not a result of fibroid and malignancy), goitre and the symptom complex, recognized as that accompanying the menopause.

The only granulomas with which we have had experience are tuberculosis and granuloma pyogenicum, of which latter we have been fortunate in having a number of cases. It is a condition described as a chronic staphylo-coccus infection occurring most frequently on the lip and very frequently on the tip of the finger. The lesion resembles a herpes, and the patient usually comes with a history of a sore on the lip or finger, for which he has done "everything," but which has not responded to treatment. Naturally one thinks of a luetic lesion, but on closer examination the true character of the lesion is apparent. For the treatment of this condition radium in one application is an absolute specific.

Our experience with tuberculosis is somewhat limited. We have one case of lupus vulgaris which is entirely well after radium treatment. We have at the present time a patient suffering from general lymph node tuberculosis (diagnosis microscopic). All palpable lymph nodes are enlarged and the condition seems to have been primary in the tonsils, the section of which showed definite tuberculosis. The

patient is still under treatment. His glands are much smaller in size; the subjective symptoms have practically disappeared.

We have had no experience with the other granulomas, such as actinomycosis, glanders and mycosis fungoides.

That group of patients presenting severe nervous symptoms, due to the approach or beginning of the menopause, offers a very fertile field for radium therapy. One may assure his patients that by the use of radium (usually one application) the menopause can be initiated immediately, all menstruation disappearing and the nervous symptoms improving greatly or disappearing entirely as a result. This is successful in 100 per cent of cases. In our experience, however, some few of them have had a little bloody discharge after six months following the treatment, and a small radium treatment at this time has been sufficient to relieve the condition.

Patients suffering from uterine hemorrhage before or near the menopause, and not due to conditions described above, under the discussion of uterine hemorrhage as a result of new growths, can be afforded relief by radium. The bleeding can be stopped at once and the patient after the treatment will no longer menstruate. This naturally precludes the radium treatment of uterine hemorrhage in younger women, as it brings on menopause and produces sterility in every instance. Let us mention that in these cases a curettement should always be done for diagnosis. In this connection we might mention a case referred by Dr. Hueman, of Benson, Neb. The patient had been suffering from uterine hemorrhage for two years and had reached a state which made one very suspicious of a pernicious anemia, her blood picture and color index being not unlike that of this condition. She had one intra-uterine application of radium, remained in the hospital about three days and after about six weeks has improved in every respect. Her bleeding stopped immediately following the radium treatment and has not reappeared. She feels much better; her color is good and her haemoglobin is now 80, an increase of 60 since her first radium treatment.

In the treatment of goitre we think that radium is of definitely more value than X-Ray, both in the change it produces in the goitre and in the fact that an operation may be done much more easily upon a goitre which has been treated by radium than upon one treated by X-Ray.

We still feel that an unsightly simple goitre or a goitre which is producing pressure symptoms should be operated. On the other hand, we think that the cases of Graves' disease should probably have radium treatment. We have had but few of these cases, but feel that a very high percentage of them will receive as good results from radium as from operation. We do know that one can destroy the thyroid parenchyma by radium. This result is explained by the production of an endarteritis of the arteries of the thyroid, followed by the death of the parenchyma.

We have been particularly gratified during the past eighteen months to find that many patients, of the type which formerly demanded prostatectomy, are relieved of all symptoms by the use of radium.

It has been our method in treating patients with enlarged prostate to first do a vasectomy, in the hope that this alone would relieve the symptoms, and which infrequently it did. It was usually necessary, however, to do a subsequent prostatectomy to give the patient much relief.

At this time it is our custom to do a vasectomy and then apply radium by means of a catheter to the prostate through the prostatic urethra. By this method a very great percentage of cases are entirely relieved, and the symptoms disappear without the patient being subjected to the fairly high mortality and the disagreeable after effects of prostatectomy.

We have found radium to be of great value in postoperative treatment of severe local infections, such as those large carbuncles which one often sees on the neck.

We wish finally to report one more striking result of radium. A young woman, married, 25 years of age, came in suffering from a pruritis vulvae of several years' standing. The condition had been treated locally without results during this time. The labia were thickened, red and tender, and the whole picture made one suspicious of a beginning malignancy. Realizing the inefficacy of local application in this condition, we decided to try radium. The patient had one treatment of several hours, and today, after two weeks, returns for examination free from distress, the first absolute comfort she had known in several years, and on examination the parts are practically normal in appearance.

In conclusion let us say that in our experience we believe radium is of definite value to the surgeon, that certain conditions, as soon as they appear, are absolute indications for the immediate use of radium, and that in many instances radium has definite advantages over the X-Ray, in that it is easier of application; it is easily controlled, offers no chance of producing malignancy in the area treated, and its application is much more comfortable to the patient. We feel that the promiscuous use of radium in the pre-cancerous and early malignant conditions is to be deplored, and that radium has superseded the knife in but very few conditions. Finally let us state that our experience has unfortunately not covered the entire field in which radium is of therapeutic value, and in this report we have been content to recite our own experience in the use of radium at the Nicholas Senn Hospital in the past two years. If to some this report seems rather incomplete, we can say only that in conditions not mentioned we have had no experience.

CALCULATION OF DOSAGES WHEN RADIUM EMANATION IS EMPLOYED

CHARLES H. VIOL, PH. D.

An increasing use of radium emanation in radium therapy and the complication in estimating dosages due to the decay of the emanation, makes convenient a table showing the total dosage in millicurie-hours, which a radium emanation preparation of one millicurie initial activity* gives during the course of its decay. Dosage in milligram-hours, where actual radium is used, is obtained by taking the product of the number of milligrams of radium and the number of hours it is applied. While this method of expressing dosage has many shortcomings, and is with-

*Radium emanation assumed in equilibrium with decay products Ra A, Ra B and Ra C.

A			B	C
T			Total milli-curie-hours per initial millicurie	Millicurie-hours per initial millicurie for succeeding hour
Days	Hours	Total Hours		
	0	0	0.000	0.996
	1	1	0.996	0.989
	2	2	1.985	0.982
	3	3	2.967	0.974
	4	4	3.941	0.966
	5	5	4.907	0.960
	6	6	5.867	0.952
	7	7	6.819	0.946
	8	8	7.765	0.938
	9	9	8.703	0.931
	10	10	9.634	0.925
	11	11	10.559	0.917
	12	12	11.476	0.910
	13	13	12.386	0.904
	14	14	13.290	0.897
	15	15	14.187	0.890
	16	16	15.077	0.884
	17	17	15.961	0.877
	18	18	16.838	0.870
	19	19	17.708	0.864
	20	20	18.572	0.858
	21	21	19.430	0.851
	22	22	20.281	0.845
	23	23	21.126	0.838
1	0	24	21.964	0.832
1	1	25	22.796	0.826
1	2	26	23.622	0.820
1	3	27	24.442	0.813
1	4	28	25.255	0.808
1	5	29	26.063	0.802
1	6	30	26.865	0.795
1	7	31	27.660	0.790
1	8	32	28.450	0.783
1	9	33	29.233	0.778
1	10	34	30.011	0.772
1	11	35	30.783	0.766
1	12	36	31.549	0.761
1	13	37	32.310	0.755
1	14	38	33.065	0.749
1	15	39	33.814	0.744
1	16	40	34.558	0.738
1	17	41	35.296	0.732
1	18	42	36.028	0.727
1	19	43	36.755	0.722
1	20	44	37.477	0.716
1	21	45	38.193	0.711
1	22	46	38.904	0.706
1	23	47	39.610	0.700
2	0	48	40.310	0.695
2	1	49	41.005	0.690
2	2	50	41.695	0.684
2	3	51	42.379	0.680
2	4	52	43.059	0.672
2	6	54	44.403	0.662
2	8	56	45.727	0.652
2	10	58	47.031	0.642
2	12	60	48.316	0.633
2	14	62	49.582	0.623
2	16	64	50.829	0.614
2	18	66	52.057	0.605
2	20	68	53.267	0.596
2	22	70	54.459	0.587
3	0	72	55.634	0.576
3	3	75	57.362	0.563
3	6	78	59.053	0.551
3	9	81	60.705	0.539
3	12	84	62.321	0.527
3	15	87	63.901	0.515
3	18	90	65.446	0.503
3	21	93	66.956	0.492
4	0	96	68.433	0.481
4	3	99	69.877	0.471
4	6	102	71.289	0.460
4	9	105	72.669	0.450
4	12	108	74.019	0.440
4	15	111	75.339	0.430
4	18	114	76.629	0.421
4	21	117	77.891	0.411
5	0	120	79.124	0.400
5	4	124	80.726	0.389
5	8	128	82.281	0.377
5	12	132	83.790	0.366
5	16	136	85.254	0.355
5	20	140	86.675	0.345
6	0	144	88.054	0.335
6	4	148	89.392	0.325
6	8	152	90.691	0.315
6	12	156	91.951	0.306
6	16	160	93.174	0.297
6	20	164	94.361	0.288
7	0	168	95.513	0.279
7	4	172	96.631	0.271
7	8	176	97.715	0.263
7	12	180	98.768	0.255
7	16	184	99.790	0.248
7	20	188	100.781	0.240
8	0	192	101.743	0.233
8	4	196	102.677	0.226
8	8	200	103.583	0.220
8	12	204	104.462	0.213

A			B	C
T			Total milli-curie-hours per initial millicurie	Millicurie-hours per initial milli-curie for succeeding hour
Days	Hours	Total Hours		
8	16	208	105.315	0.207
8	20	212	106.143	0.201
9	0	216	106.947	0.195
9	4	220	107.727	0.189
9	8	224	108.483	0.183
9	12	228	109.218	0.177
9	18	234	110.279	0.169
10	0	240	111.293	0.162
10	6	246	112.263	0.154
10	12	252	113.190	0.148
10	18	258	114.077	0.141
11	0	264	114.924	0.135
11	6	270	115.734	0.129
11	12	276	116.509	0.123
11	18	282	117.249	0.118
12	0	288	117.957	0.113
12	6	294	118.633	0.108
12	12	300	119.280	0.103
12	18	306	119.898	0.098
13	0	312	120.490	0.093
13	8	320	121.238	0.088
13	16	328	121.942	0.083
14	0	336	122.605	0.078
14	8	344	123.230	0.073
14	16	352	123.818	0.069
15	0	360	124.373	0.065
15	8	368	124.894	0.061
15	16	376	125.386	0.058
16	0	384	125.849	0.054
16	8	392	126.285	0.051
16	16	400	126.695	0.048
17	0	408	127.082	0.045
17	8	416	127.446	0.043
17	16	424	127.789	0.040
18	0	432	128.111	0.037
18	12	444	128.561	0.034
19	0	456	128.972	0.031
19	12	468	129.347	0.028
20	0	480	129.690	0.026
20	12	492	130.004	0.024
21	0	504	130.290	0.022
21	12	516	130.552	0.020
22	0	528	130.792	0.018
22	12	540	131.010	0.017
23	0	552	131.210	0.015
23	12	564	131.393	0.014
24	0	576	131.560	0.013
24	12	588	131.713	0.012
25	0	600	131.852	0.011
25	12	612	131.980	0.010
26	0	624	132.096	0.008
27	0	648	132.300	0.007
28	0	672	132.470	0.006
29	0	696	132.612	0.005
30	0	720	132.731	
Total for Complete Decay			133.333	

out great significance unless the screening of the radium, the distance between the radium and tissues, and the amount of radium employed are stated, it cannot be denied that convenience has popularized the use of the milligram-hour as a unit for recording dosages.

Radium emanation loses three-fourths of one per cent in activity per hour; so that an emanation preparation of one millicurie initial activity will, after an hour, have an activity of 0.9925 mc.* The dosage for the hour is therefore $(1.000 + 0.9925)/2 = 0.996$ millicurie-hours. At the end of the second hour there is left 0.9851 mc. of emanation and the average activity during the second hour is therefore $(0.9925 + 0.9851)/2 = 0.989$ mc. or the dosage during the second hour is 0.989 millicurie-hours (mc. hr.), and for the first and second hours combined the dosage is 0.996 + 0.989 or 1.985 millicurie-hours. Column B of the table given, which is from Kolowrat's tables as given in Mme. Curie's Traite de Radioactivite, Vol. 1, pp. 421-2, shows the summation of the milligram-hours which an initial quantity of one millicurie of radium emanation will give in t hours. Column C gives the average radio-activity of the emanation for the succeeding hour starting

*Cf. RADIUM, Vol. XIV, p. 8, Table II, Col. A.

at time t. From Column B it is evident therefore that a quantity of one millicurie of emanation will give in the course of its complete decay, a total of 133.3 millicurie-hours. This is the dosage which is attained when the radium emanation tube is buried in a growth, and remains there for more than thirty days. To estimate dosage in millicurie-hours, it is necessary to take the product of the number of millicuries of radium emanation initially applied, and the number in column B, at time t, that is, the time corresponding to the length of application. So, for example, if an emanation preparation having an initial content of 37 mc. be applied for 18 hours, the total dosage applied equals 37 x 16.838 or 623 millicurie-hours, the figure 16.838 being obtained from column B, at time 18 hours. Naturally for time intervals other than those given in the table, suitable interpolations may be made; however, since at present the technic of radium therapy does not permit of fixing the dosage necessary for the treatment of any given condition with a very high degree of accuracy, it is therefore superfluous to express the dosages with too high a degree of precision. It must be recalled that the thickness of the metal filters can cause a variation of over five per cent in the gamma ray activity due to absorption, when a thickness of several millimeters of a heavy metal is used.

When an emanation applicator is sent out for use from the point of preparation, or when it is used several times, the activity in millicuries can readily be calculated by the use of column A in table II, already referred to,* which gives the fraction of radium emanation remaining after any interval. If, for example, an emanation tube of 50 millicuries initial activity is applied twelve hours later, the activity at time of application is (0.9139 x 50) or 45.7 millicuries. If the preparation is applied for thirty hours, the dosage is (45.7 x 26.865) or 1228 millicurie-hours, 26.865 representing the cumulative dose from one millicurie in thirty hours.

To attain a dosage of say 2000 milligram-hours of radium when a 50 milligram radium preparation is available, requires its continued application for 40 hours, (2000/50 = 40). With an emanation preparation, the calculation is not so simple, but may readily be made using the table herewith. For example, if one is to estimate the time of application of an emanation preparation of initial activity of 50 millicuries to attain 2000 millicurie-hours, it follows that for each initial millicurie a cumulative dose of 40 millicurie-hours must be given, (2000/50 = 40). This cumulative dosage of 40 millicurie-hours is attained from one millicurie initial activity in approximately 48 hours. (47.5 hr. interpolated) as seen from column B of the table.

REVIEWS AND ABSTRACTS

John G. Clark, M. D., (Philadelphia). The Treatment of Myoma Uteri with Radium. Jour. A. M. A., lxxiii, 957-959, September 27, 1919. Read before the Section on Obstetrics, Gynecology and Abdominal Surgery at the Seventieth Annual Session of the American Medical Association, Atlantic City, June, 1919.

"Sufficient time has now elapsed since my associates and I began the treatment of myomas and myopathic hemorrhages of the uterus with

*Loc. cit.

radium to arrive at a just estimate of its therapeutic value. Within certain limitations we may, with positive assurance, from our observation of more than 150 cases, assume that, from the standpoint of efficiency, safety and morbidity, this remedy must supplant surgical intervention in these tumors and for the relief of intractable myopathic hemorrhages. Beyond these limitations, however, we are also convinced that surgery still has a dominant place in the treatment of properly selected cases. Our experience of the last four years in the use of radium has, therefore, marked out rather well-defined lines of procedure, on which we may advance with safety. In any field of endeavor the danger of any innovation is that too much may be expected of it; likewise, too much is often claimed for it."

"In our first experience we limited the use of radium to women within the menopausal cycle, and we have only gradually, and to a very limited extent, worked outside of this physiologic boundary, for we are convinced that in young women heedless radiation may be quite as unfortunate in its results as were the early efforts of overenthusiastic or poorly balanced ovariotomists. Radium is quite as potent in its power to bring on a premature menopause, and it is quite as upsetting to the nervous equilibrium of a young woman, as the removal of the ovaries. Fifty mg. of radium applied for twenty-four hours within the uterus of a young woman will in many instances bring on an abrupt and serious menopause; and while in our series of cases one or two patients have received this dosage, it was given in our earlier experience, when the potentialities of radium were not fully realized and its dosage was yet within the period of experimental endeavor. We quickly learned that a moderately prolonged intra-uterine application was most hazardous and not to be repeated. As we view this question, three essentials are capital in the use of radium; first, an accurate diagnosis in all cases; second, the proper selection of cases; and third, the careful graduation of dosage, beginning when young women are being treated, with a minimum application and increasing the duration of application slightly if the first attempt fails to check the excessive flow."

"In our study of results in women within the menopausal years, certain facts stand out in relief. Among the most obvious are these: The tumor must be uncomplicated with coincident inflammatory disease: it must be causing hemorrhage, and it should not be too large. In our cases, when pain, even without coincident evidences of inflammatory disturbance, has been present, it is seldom relieved even though the tumor largely disappears; and in other instances in which there was an old salpingitis, a flare-up of a quiescent process has occurred. In two cases a subsequent operation was necessary—in one a hysterectomy and in the other a vaginal puncture of a large pelvic abscess was necessary to relieve the patient. These two instances alone in our large series would not cast great discredit on this procedure, if all the other patients suffering with pain had been relieved of this symptom as the tumor decreased in size and menorrhagia ceased. Such, however, has not been the case; and we have, therefore, established a rigid rule that no patient suffering with pain lateral to the uterus is to be radiated. We choose an operation instead, for we can then ascertain the extent of the pathology and treat it conservatively or radically, according to the indications. In this connection we desire most emphatically to protest against the use of radium in the treatment of any acute or quiescent inflammatory case, whether associated with a myoma or standing alone.

One of my esteemed colleagues, a radiologist, informs me that this point should be emphasized especially, for already an occasional enthusiast asserts that radium may be beneficial in the treatment of pyosalpinx. This degree of optimism is very dangerous, and cannot too quickly be discredited, for we have already observed its evil."

"In keeping this remedy well within its proper bounds, its great value may be established without reflections on it; but through such a policy as that just referred to, its employment will be discredited. The proper selection of the tumor to be treated from the standpoint of size and symptomatology is also clearly necessary, for a therapeutic policy that covers all myomas regardless of structure is, as we view our experience, without justification. We have seldom used radium in a tumor larger than the size of a five months' pregnancy, and then only under very exceptional circumstances, such as in the presence of grave cardiac or renal complication or serious constitutional defects which plainly rendered any operation too dangerous. The rule which we generally follow is to confine this treatment to cases in which the tumors are the size of a three months' pregnancy or smaller. This policy is based on previous years of experience in the surgical treatment of myoma, which has established the great frequency of associated lesions in these large tumors, and we believe, therefore, that we serve a better end in recommending an operation in this class of cases than the application of radium."

"One not infrequently finds in many cases a degree of anemia not accounted for by the loss of blood, and a complexion more like that of cachexia than occurs with an uncomplicated anemia; and furthermore, there is an asthenia of a toxic type which is not satisfactorily accounted for by a simple blood loss. Seldom is a malignant condition encountered, but not infrequently varying stages of degeneration of the tumors are discovered on macroscopic section marked by a grayish red or slaty discoloration of some of the tumors, indicating a partial gangrene, in others liquefaction necrosis, etc. Through the absorption of these necrotic or degenerating materials, serious inroads on the patient's constitution have occurred and a rapid healthful rebound follows a hysteromyomectomy. Based on these observations, we cannot look with favor on the conversion of these large tumors through radiation into retrogressive tissues, which through absorption may cause toxic symptoms. Under such conditions the patient may serve as the sarcophagus for her decadent tumor. Also, these large tumors are very frequently associated with, or through pressure have produced, other lesions, especially of the inflammatory class. Frequently pressure symptoms have forced the patient to consult the surgeon, and there may be no variation of the menses from the normal. In such cases the tumor may be a pure fibroid, largely of a dense hyaline or calcareous type, certainly not responsive to radiation."

"For these, and still other reasons, therefore, we find no evidence thus far in our experience to convince us that the large tumors should not be removed by approved surgical methods. In no instance has there been so quick a decrease in the size of even the smaller tumors to justify us in believing that the larger tumors which are giving pressure symptoms will diminish sufficiently rapidly in even six months or a year to give satisfactory relief. We stand, therefore, on the general principle against radiation in tumors larger than a three months' pregnancy, and in only the exceptional case do we deviate from this rule."

"Those who decry the use of radium in all myoma cases ring the

changes on the dangers of sarcoma. Such objections have no basis in fact, for seldom, indeed, is sarcoma a degenerative or concomitant evil of myoma. If it were as common as is asserted by some of these alarmists, out of every series of 100 partial hysterectomies, as are usually performed by American surgeons, a definite percentage of recurrent sarcomas in the cervical stump should be encountered. In more than 1,000 hysterectomies performed in the gynecologic department of the University Hospital such a sequel has been observed but once. In a review of 816 myomas in our laboratory by my associate, Dr. Charles C. Norris, he finds only thirteen sarcomas, or less than two per cent., which were not diagnosed at the time of operation, only twenty-six such cases in all this series having been encountered. Based both on clinical and on laboratory conclusions, therefore, we deal with fears solely within the domain of fallacious supposition in discussing the dangers of sarcomatous changes in myomas and fibromas. Even were these fears justified, there would still be no strong argument against the use of radium, since these tumors quickly react to this influence. It is not, therefore, the fear of sarcomatous degeneration which makes us slow to radiate large tumors, but it is because of the other objections just enumerated. To define our policy clearly, we would say that we radiate chiefly for one symptom, and that is hemorrhage. In myopathic changes in the uterus and in the smaller myomas causing excessive flow a safer or more certain means of relieving this symptom has not been found, for it acts with clocklike regularity, and we therefore consider a small myomatous uterus causing menorrhagia in a middle aged woman as no longer within the surgical domain. When radium is not available, the use of the roentgen ray in skilled hands may take its place. In the near future, therefore, we believe that the surgeon who operates in this type of cases will have a difficult task ahead of him in justifying his action."

"Symptoms Accompanying Radiation. Under special headings may be enumerated some of the occasional symptoms accompanying radiation:

"*Nausea.*—Frequently within from twenty-four to forty-eight hours after the intra-uterine application of radium the patient will experience considerable nausea, not, however, greater than that observed after the administration of one-fourth grain of morphin in the occasional case. As we always perform a dilatation and curettage under nitrous oxid anethesia, with a preliminary one-fourth grain of morphin administered one hour before the anesthetization, we have often felt that there were about equal chances between the effects of the radium and the morphin in the production of the symptoms; for nausea and vomiting are the exception rather than the rule after radiation. In no case has this symptom been either alarming or persistent.

"*Pain.*—This symptom is also a variable factor, and may be attributable to the curettage, which is performed in all of these cases for diagnostic assurance. When this symptom persists or is accompanied by fever, we fear the possibilities of an acute inflammatory attack or the exacerbation of a quiescent lesion. This complication has occurred but seldom. However, it has been noted in possibly twenty or thirty instances in our series, and we are inclined to adopt in the future the plan of merely dilating the cervix and inserting the radium in those cases of periodic menorrhagias following a cyclic menstrual type without intermenstrual spotting; for in no instance have we discovered a carcinoma of the fundus in any of these cases, notwithstanding a careful

routine study of the curettings. In those cases, however, in which there is intermenstrual spotting, or in which there is continuous bleeding curettage should never be omitted, for this is the court of final diagnostic resort. When this very suggestive symptom has been present, carcinoma of the fundus has occasionally been encountered and an immediate or subsequent hysterectomy has been performed. A simple hysterectomy carries so high a percentage of cures in this class of cases that we never trust to radium, but invariably choose the more radical surgical measure.

"*Leukorrhea.*—The rule in all of our cases has been that a yellowish but never profuse leukorrhea will follow radiation for a short time—usually from three to six weeks. Hemorrhage likewise may not cease at once, although this is the rule. We warn our patients against apprehension if the flow does not cease at once, and usually tell them to expect no decided result under six weeks, although the great majority are relieved at once of excessive bleeding, but have a somewhat yellowish, sticky discharge for possibly six weeks, after which it ceases. In several instances a profuse leukorrhea has actually been cured by radiation.

"*Menopause.*—The change of life in these cases varies in its phases, as the constitutional and temperamental characteristics of women vary. In this connection one might employ the lines of the comic opera librettist: "There are never two women alike, and never one woman alike twice." In the more marked grades of anemia we believe the climacteric change is more abrupt and attended with more pronounced symptoms. This may be explained on the theory that the hematogenous system has been working for weeks or months at a great speed in corpuscular generation, since the continuous loss of blood is so great that this excessive deficit must be remedied. A quick check on this great activity must in many instances jar the physiologic equilibrium and thus induce a more acute menopause. So far as we are able to judge, we believe that the menopause is somewhat more trying to the average woman under an abrupt cessation than when she drifts into this change more naturally. In estimating the possible objections to radiation this symptom may possibly be classed in this light, although it in no way differs from the same sequel after a hysterectomy in which the ovaries are removed. In general, we find our patients very enthusiastic over their results, and count this possibly trying symptom as of light moment compared with their satisfaction over an escape from an operation."

"Failure to Relieve—In four cases we have failed to relieve patients sufficiently to satisfy them or ourselves, and we have subsequently resorted to a hysterectomy. Two patients have been operated on in other clinics. So far as we have observed, no disadvantage has occurred from the preliminary radiation, as all of the patients on whom an operation has been performed have recovered without complication."

"Technic of Application—In our entire series of cases we have varied but little in our method of treatment. For women in the menopausal years, one extra-uterine application of 50 mg. of twenty-four hours' duration is made. Under gas the cervix is dilated and a simple curettage for diagnostic purposes is performed, followed by a light packing of the uterine cavity with a 5 per cent. solution of iodin momentarily before the radium is introduced. We enclose the platinum or silver radium container in a black rubber drainage tubing securely tied at each end. A 50 mg. tube is inserted into the fundal cavity to the

top and left thus for twenty-four hours. When the cavity is 3½ inches or more in depth, we usually use 25 mg. tubes arranged in the rubber tubing tandem fashion, to insure a wider radiation of the uterine wall. After the radium is withdrawn, we usually keep the patient in bed three days, as after ordinary curettage, and at the end of five days she is discharged and permitted to resume her ordinary duties."

"In women under 40 years of age we grade the dosage largely according to their years. As a rule, if the menorrhagia is excessive we may leave the tube in place twelve hours if the patient is over 35. In still younger women we never apply it more than six hours, choosing rather to make a reapplication several weeks later if the first fails. In this way the menopause will not be induced. There are several instances in our series in which normal menses have occurred after an interval of weeks or months, even when a twenty-four hour dosage has been applied; but as a rule the menopause is permanent."

"RESULTS—In one phenomenal case, that of a woman aged 32, married ten years and sterile, who had suffered from severe menorrhagia which had reduced her hemoglobin below 35 per cent., the flow ceased quit abruptly and she passed through a rather severe menopausal period and yet became pregnant and went to term; but through a severe postpartum hemorrhage the poor woman lost her life. In many instances patients have passed through a typical climacterium, and the periods have returned and have then resumed a normal menstrual physiology. This phenomenon has been sufficiently frequent to make us believe that the radioactivity of the usual dosage is expended chiefly within the uterus and not on the ovaries. In considering the amount of radium employed in these cases, we feel that the smaller dosage, such as we have indicated, has given very satisfactory results, and, therefore, it is within the easy range of every well equipped hospital to have available at least 100 mg. of this substance for use in their clinical departments. It should, however, be placed within the jurisdiction of one capable clinician of the staff to advise as to its use. Certainly it is not a remedy for haphazard use, for it requires the training and judgment of a skilled specialist to advise as to when and how it should be applied."

* * * *

Howard S. Jeck, M. D. (New York). Apparent Cure of Carcinoma of the Bladder by Radium. Int. Jour. of Surg., xxxii, 240-241, August, 1919. Presented, May 21, 1919, before the Section on Genito-Urinary Surgery of the New York Academy of Medicine.

"This patient, C. A., who came to me on July 1, 1918, complained chiefly of hematuria which she had noticed for about four months. There was no especial frequency of urination by day, and only occasionally was she obliged to get up at night to pass her urine. At the time of my first examination her urine was quite bloody. I cystoscoped her at once and found an irregular red papillary growth about the size of a raspberry just to the left of the left ureteral orifice. There was a small sloughy area over part of the growth. I am not absolutely positive, but I believe the growth was sessile rather than pedunculated. Vaginal examination showed no induration of either uterus or vagina. The tumor had the macroscopic appearance of a malignant papilloma. I later learned that a small piece of the growth had been removed at Mount Sinai Hospital by means of the operating cystoscopic forceps. The diagnosis at the Mount Sinai Pathological Laboratory was squamous-celled epithelioma."

"On July 9, 1918, I gave her her first radium treatment. This consisted of two tubes of radium emanation of 31 and 37 mc. respectively, for seven hours, or a total of 476 mc. hours. The glass tubes containing the radium emanation were screened by silver tubes of ½ millimeter thickness, which were in turn put in rubber tubes for convenience in introducing them into the bladder. She noticed no more bleeding after the first treatment until a week later, when it was slight only, but she suffered from a little increase in frequency of micturition, which must have been due to a radium burn."

"On August 6, 1918 (about a month later), I cystoscoped her again and was disappointed to find no change in the appearance of the growth. I accordingly inserted another tube of 40 mc. of radium emanation which I intended to leave for ten hours, but she expelled it spontaneously at the end of seven hours. In about a week her frequency became a little more marked, but hematuria, while still present, was considerably less and in another two weeks it stopped altogether."

"On September 10, 1918, a little over one month after the second treatment, her urination by day became almost normal again, and every now and then she could go an entire night without getting up to pass her urine."

"On September 24 (approximately six weeks after the second treatment), I cystoscoped her again and all that remained of the original lesion was a slightly raised reddish looking area about the size of a five-cent piece. She remained in about the same condition with very slight frequency by day, occasional frequency by night, and occasional slight hematuria until the 19th of November, 1918, when she was again cystoscoped. This time I found an enlongated sloughy growth more of the indurative type, about twice the size of one's index finger-nail, at the site of the original tumor. Anterior to the growth there were soft, small, smooth, reddish elevations resembling small cobble stones. I thought the growth was not behaving as well as it should, and this time gave her two tubes of radium of 70 mc. each for five hours, or a total of 700 mc. hours. I took especial pains to get both tubes as near the growth as possible and succeeded with the aid of the cystoscope in applying them immediately over the tumor. Another vaginal examination at this time was negative. In a few days after the November treatment she again began to suffer from frequency, both by day and night, urinating every two hours by day and twice at night. However, the hematuria ceased completely and has not been noticed since."

"Brief reports of subsequent examinations are as follows:"

"January 28, 1919. Urinates once at night (occasionally, not every night), and every 3 to 4 hours by day. Appetite good; feels good; thinks she has gained in weight. *Cystoscopy*: A reddish area, about the size of a dime, at the site of the original tumor."

"February 25, 1919: Symptoms same as on preceding examination."

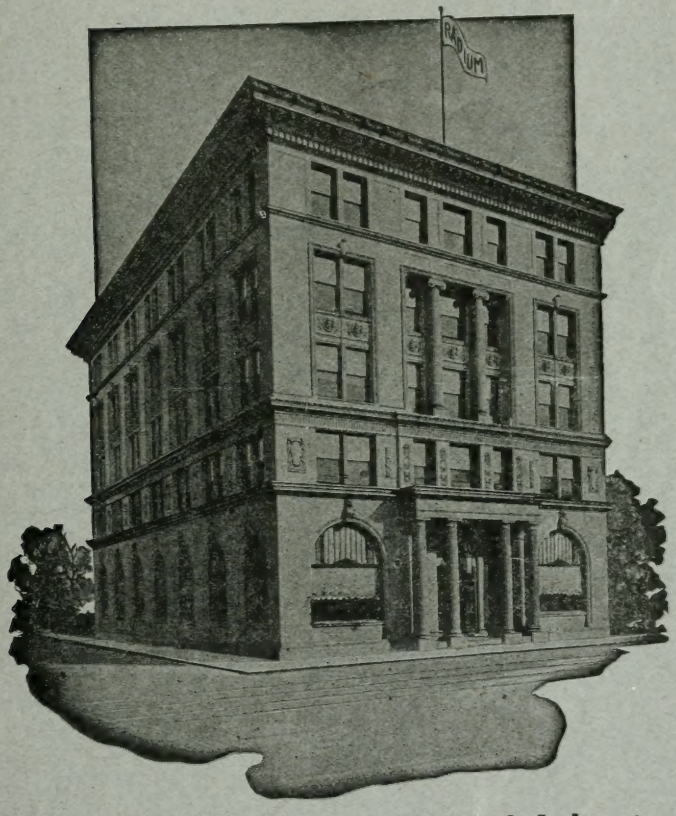
"March 18, 1919: Tumor entirely gone; bladder clean."

"April 8, 1919: Same. Weight 109 as opposed to 85 at beginning of treatment."

"May 13, 1919 (a week ago yesterday): Urinates every four hours by day; not at all at night. Occasional slight burning on urination. Appetite good. *Cystoscopy*: Bladder absolutely clean (Dr. Barringer was present at the cystoscopic examinations, except the first, and corroborated the findings. Dr. Goeller also present at the last cystoscopy)."

STANDARD CHEMICAL COMPANY

PITTSBURGH, PA.



General Offices and Radium Research Laboratory, Standard Chemical Company, Pittsburgh, Pa.

Miners of Uranium and Vanadium Ores, and Producers of Radium

STANDARD CHEMICAL COMPANY

RADIUM

STANDARD CHEMICAL CO.

Complete installations of latest apparatus for the collection, purification, tubing and measurement of Radium Emanation.

Departments of Physics and Medicine for instruction in physics of Radium, the technic of preparing Radium Emanation tubes and the therapeutic application of Radium and Ranium Emanation.

Radium preparations sold on the basis of measurement by the United States Bureau of Standards.

Information as to equipment, technic and dosage upon request.

RADIUM CHEMICAL COMPANY

GENERAL OFFICES AND LABORATORIES

Pittsburgh, Pa.

New York
501 Fifth Avenue.

Boston
Little Building.

Chicago
Marshall Field Annex Building.

London
Watson & Sons, (Electro-Medical) Ltd.
43 Parker Street, Kingsway, W. C. 2.